PEPWAVE

Broadband Possibilities

AP One

User Manual

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Dec-10

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1 Introduction and Scope

Pepwave AP One is an enterprise grade 802.11b/g/n Wi-Fi access point with centralized management system. It is a powerful solution for building wireless networks for all business needs. Each Pepwave AP One is loaded with essential features such as Multiple SSID, VLAN, WDS and Guest Protect.

One Pepwave AP One can masquerade up to 4 different access points. Each virtual access point can have its own security policy (e.g. WPA, WPA2, etc.) and authentication mechanism (e.g. 802.1x, open, captive portal, etc), to facilitate building your network much faster, easier and more cost-effective than ever before. Pepwave AP One comes with a high-power Wi-Fi transmitter which greatly enhances coverage and performance.

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2 Product Features

Key features of Pepwave AP One:

- High-power output enhances coverage and lowers cost of ownership
- Independent security policies and encryption mechanisms per virtual AP
- Centralized management via InControl
- WDS Support for secure and fast network expansion
- Guest Protect Support
- WMM (Wi-Fi Multimedia) and QoS (Quality of Service) Support

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3 Package Contents

The following items are the contents of a Pepwave AP One package:

- 1 x Pepwave AP One unit
- 1 x Omni-directional Antenna
- 1 x Power Supply Unit
- 1 x Instruction Sheet

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4 Pepwave AP One Overview

4.1 Front View

4.2 Rear Panel View

Connectors	
Antenna (Left-most Connector)	A RP-SMA connector for connecting the antenna.
WAN	A 10/100BaseT Ethernet connector, normally to be connected to back haul network.
Reset	A reset button to be depressed with a pin. Depress and hold for at least 5 seconds to restore factory defaults. For further details, please refer to Section **10, Restoration of Factory Defaults**.
Power Connector	A connector for DC 12V power input, to be connected with the supplied power adaptor.

LED Indicators	
Power	OFF – Power off
	ON – Power on
Status	OFF – The unit is initializing.
	ON – The unit is ready.
Ethernet	OFF – The Ethernet port is not connected.
	ON – The Ethernet port is connected.
Wireless	OFF – Wireless is not ready.
	On – Wireless is ready.

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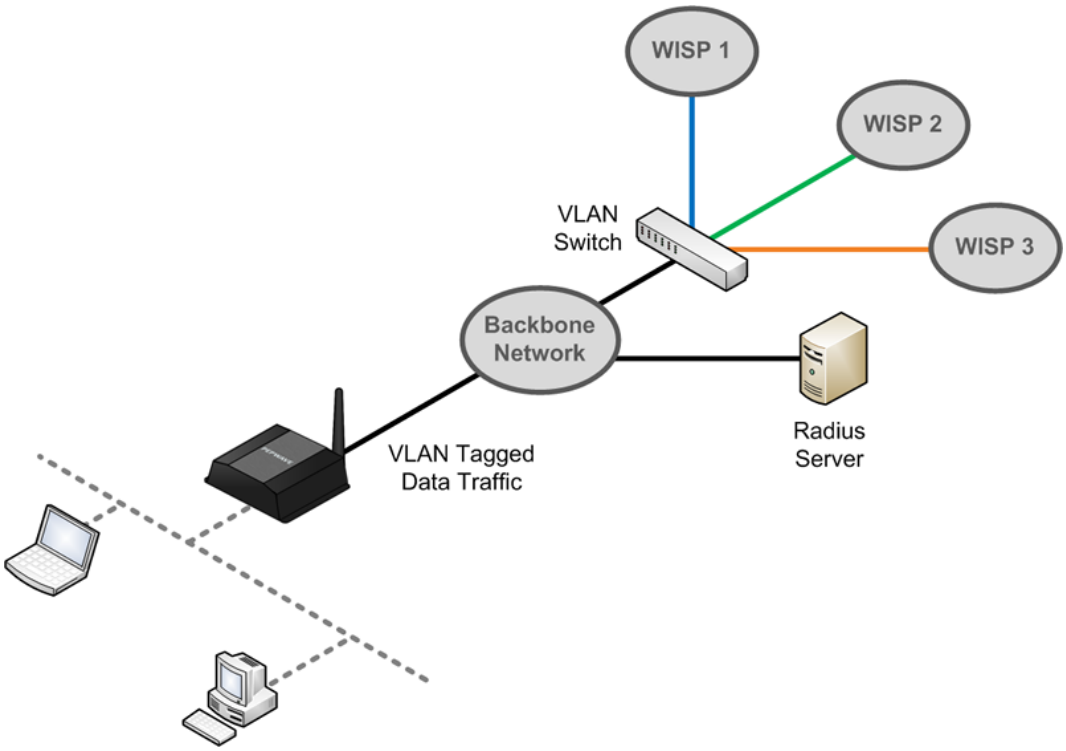
5 Installation

Pepwave AP One acts as a bridge between the wireless and the wired Ethernet interface. A typical setup is as follows:



5.1 Installation Procedures

1. Attach the antenna to the Pepwave AP One unit.
2. Connect the Ethernet port on the unit with the backbone network using an Ethernet cable. The port could auto sense the cable is straight-through or cross-over.
3. Connect the power adapter to the power connector of the unit, and then plug in the power adapter.
4. Wait for the status LED to turn green.
5. Connect a PC to the backbone network, and configure the IP address of the PC to be any IP address between 192.168.0.4 and 192.168.0.254, with subnet mask of 255.255.255.0.
6. With Microsoft Internet Explorer 6 or above, or Mozilla Firefox 2.0 or above, or Google Chrome 2.0 or above, connect to the URL https://192.168.0.3.
7. When asked, enter the default admin login ID and password, **admin** and **public** respectively.
8. After logging in, the following Information main page appears. Please go to ***Configure > System*** to facilitate further configuration of the Pepwave AP One unit.

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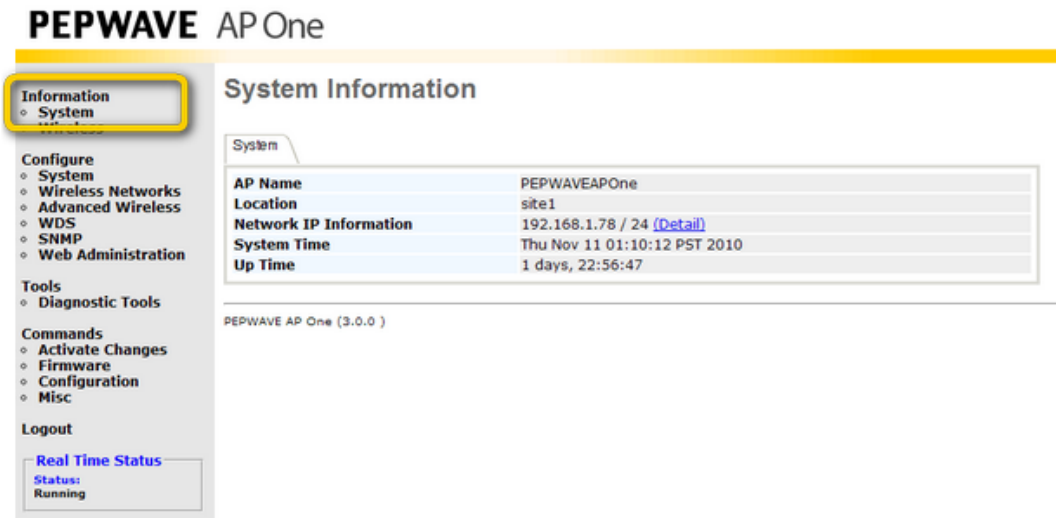
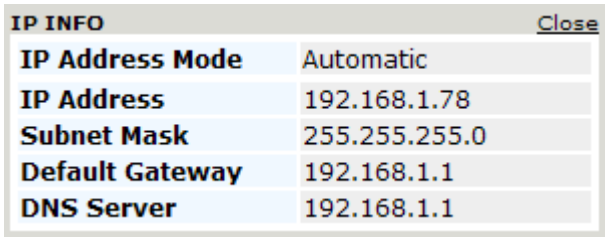
6 Information

6.1 System



System Information	
AP Name	This field shows the name of the AP One device defined in the configuration.
Location	This field shows the location of the AP One device defined in the configuration.
Network IP Information	This shows the current gateway IP of the AP One device.
System Time	This shows the system time in respect to the time zone selected.
Up Time	This shows the up time of the device since it is booted up.

Click on the ***Detail*** link next to the **Network IP Information** to check the following system information: *IP Address Mode, IP Address, Subnet Mask, Default Gateway, DNS Server*.



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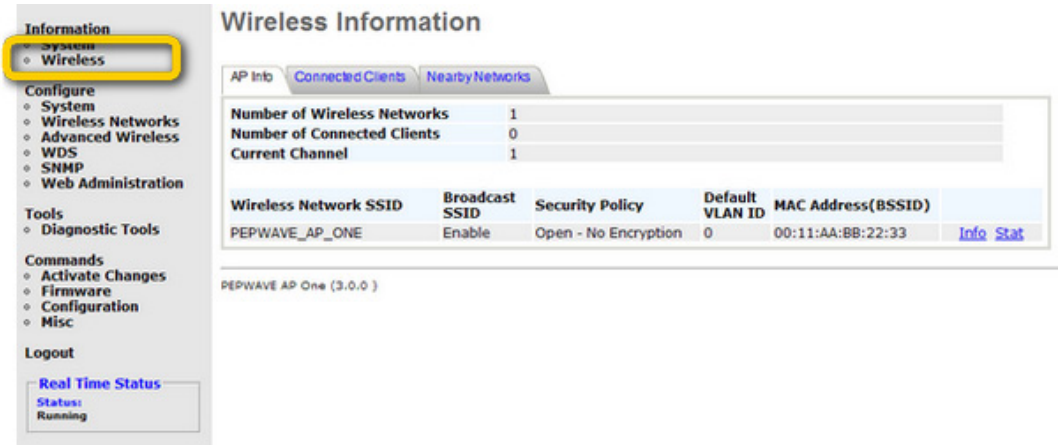
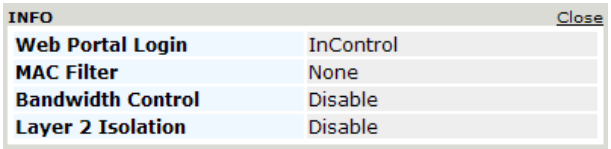
6.2 Wireless

6.2.1 AP Info

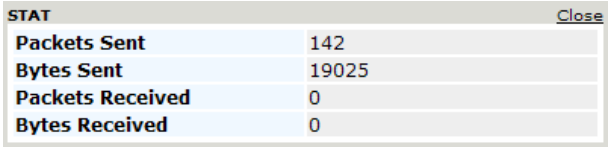


Wireless Information – AP Info	
Number of Wireless Networks	This indicates the number of wireless networks.
Number of Connected Clients	This indicates the number of associated clients.
Current Channel	This shows which 802.11 channel the system is using.
Wireless Network SSID	This shows which SSID the client is associated.
Broadcast SSID	This setting shows whether or not the ESSID of this wireless network profile can be scanned by Wi-Fi clients.
Security Policy	This setting shows the wireless authentication and encryption methods.
Default VLAN ID	This setting shows the VLAN ID tagged on all outgoing packets generated from this wireless network profile.
MAC Address (BSSID)	This shows the detailed BSSIDs for that particular wireless network profile.

Click on the ***Info*** link to check the following wireless information: **Web Portal Login**, **Wireless Network Firewall**, **MAC Filter**, **Bandwidth Control**, **Layer 2 Isolation**.



Click on the ***Stat*** link to check the following networking statistics: **Packets Sent**, **Bytes Sent**, **Packets Received**, **Bytes Received**.



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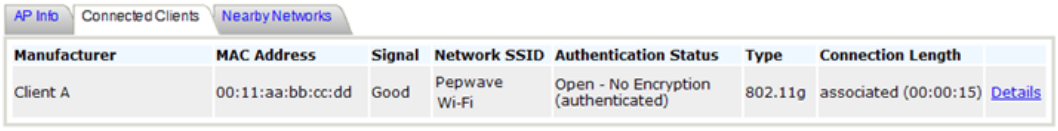
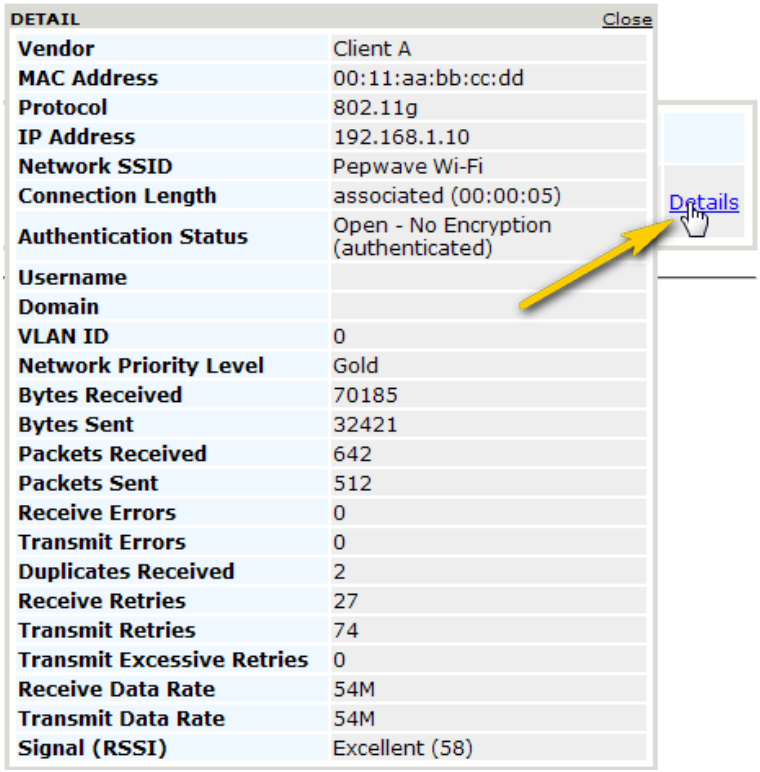
6.2.2 Connected Clients



Wireless Information – Connected Clients	
Manufacturer	This shows the manufacturer based on the MAC prefix.
MAC address	This shows the client MAC address.
Signal	This shows the signal strength.
Network SSID	This shows which SSID the client is associated.
Authentication Status	This shows the client authentication method(s).
Type	This shows the radio mode of the client.
Connection Length	This shows the associated duration.

Click on the **Details** link, more networking statistics will be provided.



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Wireless Information – Connected Clients - Details	
Vendor	This shows the manufacturer based on the MAC prefix.
MAC Address	This shows the client MAC address.
Protocol	This shows the radio mode of the client.
IP Address	This shows the IP address of connected client.
Network SSID	This shows which SSID the client is associated.
Connection Length	This shows the associated duration.
Authentication Status	This shows the client authentication method(s).
Username	This shows the user name of the connected client.
Domain	This shows the domain name of the connected client.
VLAN ID	This shows the VLAN ID of the connected client.
Network Priority Level	This shows the priority level of internet transfers of this connect client.
Bytes Received	This shows the transmitted size this client received from the AP.
Bytes Sent	This shows the transmitted size this client sent out to the AP.
Packets Received	This shows the packet number this client received from the AP.
Packets Sent	This shows the packet number this client sent out to the AP.
Receive Errors	This shows the number of errors this client received from the AP.
Transmit Errors	This shows the number of errors this client transmitted to the AP.
Duplicates Received	This shows the number of duplicates received by the client from the AP.
Receive Retries	This shows the number of retries this client received from the AP.
Transmit Retries	This shows the number of retries this client transmitted to the AP.
Transmit Excessive Retries	This shows the number of excessive retries this client transmitted to the AP.
Receive Data Rate	This shows the receive data rate of the client from the AP.
Transmit Data Rate	This shows the transmit data rate of the client to the AP.
Signal (RSSI)	This shows the signal strength received by the client.

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6.2.3 Nearby Networks

Wireless Information – Nearby Networks	
Network Discovery	This shows if the AP would scan and discover nearby network.
Scanning Interval	This shows how often the AP goes to other channels to discover nearby AP.
Scanning Time	This shows how long the AP stays on the other channels to discover a nearby AP.
Manufacturer	This shows the manufacturer based on the MAC prefix.
SSID	This shows which SSID the client is associated.
Security	This shows the client authentication method(s).
MAC address	This shows the client MAC address.
Channel	This shows the channel of the existing Bssid.
Signal (RSSI)	This shows the signal strength.
Last Seen	This indicates the time stamp of the access point sc
Status	This shows the current status of this nearby network.

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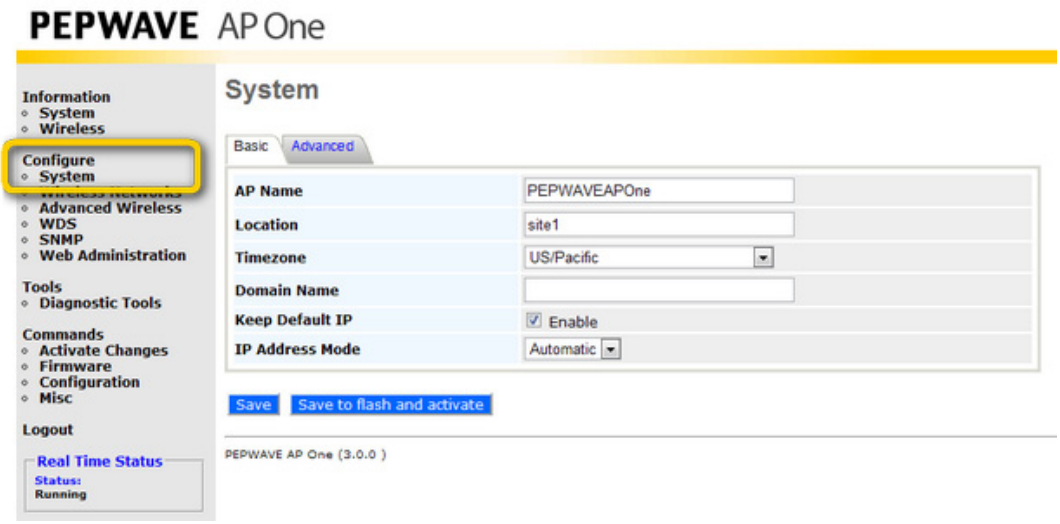
7 Configuration

7.1 System

Upon selecting **System** under **Configure** section from the navigation bar on the left, the following page shows the configuration options:

7.1.1 Basic



System Settings - Basic	
AP Name	A user-specified name for this access point. This value can be retrieved via SNMP.
Location	A user-specified name for the location of the access point. This value can be retrieved via SNMP.
Timezone	This option specifies the time region to be used for representing the time on the system.
Domain Name	Domain name can be set for wireless clients to have a readable name for the web management.
Keep Default IP	With this option disabled, default IP **192.168.0.3** of the device will be disabled.
IP Address Mode	The options are **Automatic** and **Manual**. **Automatic**: IP address of the Pepwave AP One unit is acquired from a DHCP server on the Ethernet segment. **Manual**: A user-specified IP address is used.
IP Address Mode – Manual	
Static IP Address	This specifies the unique IP address for the Pepwave AP One unit to communicate on the Ethernet segment. This IP address is distinct from the admin IP address 192.168.0.3 on the Ethernet segment.

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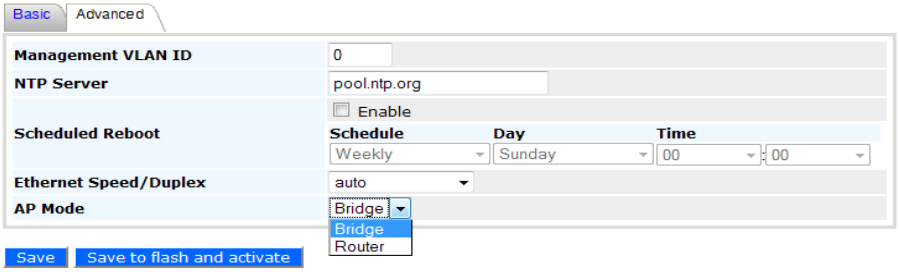
Subnet Mask	This setting specifies the subnet mask of the Pepwave AP One unit.
Default Gateway	This setting specifies the default gateway of the Pepwave AP One unit.
DNS Server	This is the DNS server address to be used by the Pepwave AP One unit for resolving host names.
IP Address Mode – PPPoE	
PPPoE Username	This specifies the username required in order to connect via PPPoE to acquire Internet connectivity. The information is typically determined by and can be obtained from the ISP.
PPPoE Password	This specifies the password required in order to connect via PPPoE to acquire Internet connectivity. The information is typically determined by and can be obtained from the ISP.
PPPoE Service Name	This is a PPPoE parameter which is provided by the ISP. Note: Leave this field empty if you are not sure.

7.1.2 Advanced



System Settings - Advanced	
Management VLAN ID	This specifies the VLAN from which management sessions are allowed. The establishment of management sessions is restricted only to the specified VLAN ID. If Management VLAN ID is set to zero, no VLAN restriction is applied. The default value of this setting is **zero**. It means **no tagging** is enabled (instead of tagged with zero).
NTP Server	This is the Network Time Protocol (NTP) Server hostname to be used for synchronizing system clock of Pepwave AP One. The default value of this setting is **pool.ntp.org**.
Scheduled Reboot	The system would perform reboot based on the scheduled time set. Click the box above the Schedule to **Enable** this feature.
Ethernet Speed/Duplex	This setting provides the option to set the speed of the Ethernet.
AP Mode	Available options are **Bridge** and **Router**. With this option set as Router, the following ***Manual Router Settings*** will be available.

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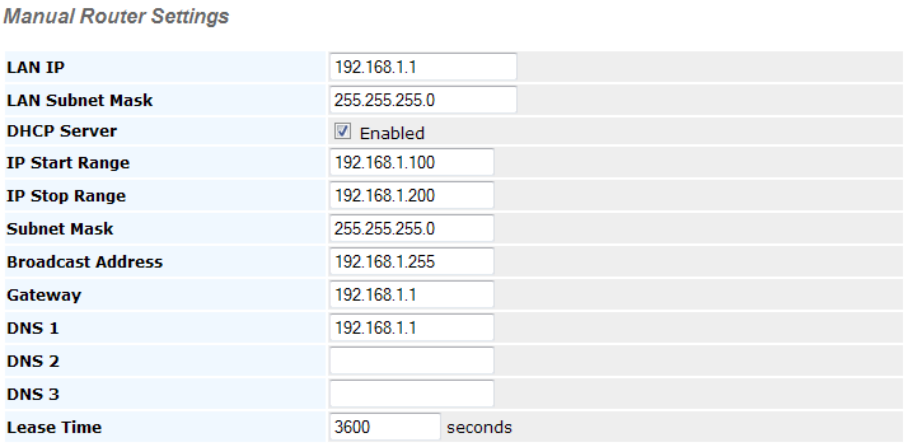
7.1.3 Manual Router Settings

Manual Router Settings will only be available when the AP Mode in the previous section had been selected as **Router** mode. You can use the AP One as a DHCP server for other devices behind.



DHCP Server Parameters	
LAN IP	This setting specifies the DHCP server IP address.
LAN Subnet Mask	This setting specifies the subnet mask of the DHCP server.
DHCP Server	Checked the box to enable the DHCP Server of this device. Following options will be enabled once you have checked and enabled the service.
IP Start Range	This setting specifies the first address in the range of IP addresses to be assigned to DHCP clients.
IP Stop Range	This setting specifies the last address in the range of IP addresses to be assigned to DHCP clients.
Subnet Mask	This setting specifies the subnet mask to be used by DHCP clients.
Broadcast Address	This setting specifies the broadcast address to be used by DHCP clients.
Gateway	This setting specifies the default routing gateway to be used by DHCP clients.
DNS 1	This setting specifies the IP address of the primary DNS Server to be offered to DHCP clients.
DNS 2	This setting specifies the IP address of the secondary DNS Server to be offered to DHCP clients.
DNS 3	This setting specifies the IP address of the tertiary DNS Server to be offered to DHCP clients.
Lease Time	This setting specifies the length of time throughout which an IP address of a DHCP client remains valid. Upon expiration of the Lease Time, the assigned IP address will no longer be valid and the renewal of the IP address assignment will be required.

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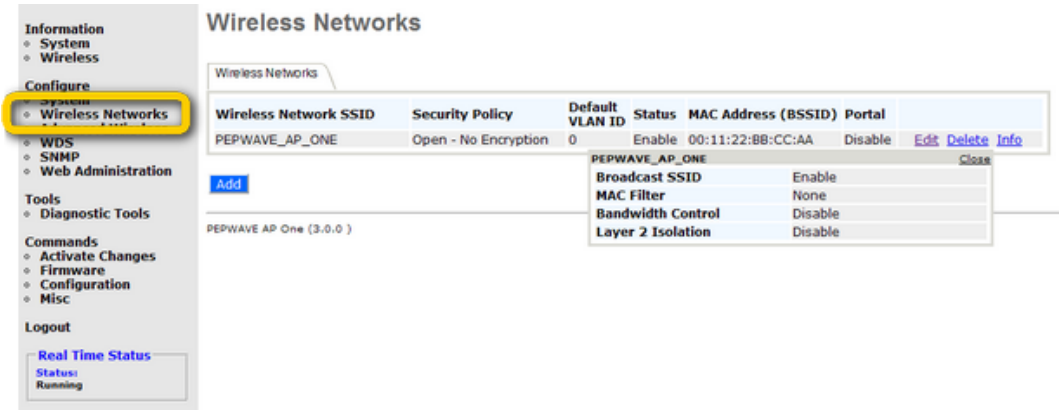
7.2 Wireless Networks

Upon selecting ***Wireless Networks*** under Configure section from the navigation bar on the left, the following shows the configured SSID available on the system:



General Wireless Networks Settings	
Wireless Network SSID	The SSID of the virtual Access Point (AP).
Security Policy	Shows the configured wireless authentication and encryption methods.
Default VLAN ID	This setting specifies the VLAN ID to be tagged on all outgoing packets generated from the virtual AP (i.e. packets that travel from the Wi-Fi segment, through the Pepwave AP One unit to Ethernet segment via the LAN port). If 802.1x is enabled, a per-user VLAN ID can be specified in the authentication reply from the Radius server. If it is set, the value specified via Default VLAN ID will be overridden.
Status	Shows whether the virtual AP is enabled or disabled.
MAC Address (BSSID)	Shows the detailed BSSIDs.
Portal	Shows if the InControl Guest Portal is enabled. Please refer to section 7.2.2 for details.

To add a new virtual AP, click the **Add** button. To modify the settings for a virtual AP, click the link **Edit** on the right of the desired WLAN SSID, upon which the following ***Wireless Network Details*** is displayed.

Click on the **Info** link to check the following networking statistics: **Broadcast SSID**, **MAC Filter**, **Bandwidth Control**, **Layer 2 Isolation**.

General Wireless Networks Settings – Info	
Broadcast SSID	This shows if the Broadcast SSID feature of this network is enabled.
MAC Filter	This shows if the MAC Filter feature of this network is enabled.
Bandwidth Control	This shows if the Bandwidth Control feature of this network is enabled.
Layer 2 Isolation	This shows if the Layer 2 Isolation feature of this network is enabled.

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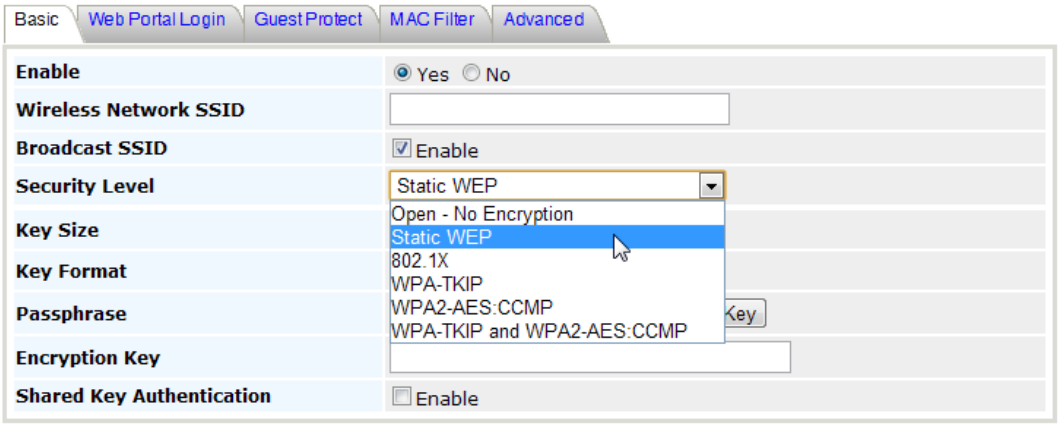
7.2.1 Wireless Network Details - Basic



Wireless Networks Details - Basic	
Enable	Select Yes to enable the virtual AP, or No to disable the virtual AP. By default, the virtual AP is **enabled**.
Wireless Network SSID	This setting specifies the SSID of the virtual AP to be scanned by Wi-Fi clients.
Broadcast SSID	This setting specifies whether or not the ESSID of the virtual AP can be scanned by Wi-Fi clients. Note that the BSSID (i.e. the MAC address of the virtual AP) cannot be hidden from the scan. To associate with the virtual AP, clients must specify the correct ESSID upon association. Broadcast SSID is **enabled** by default.
Security Level	This setting configures the wireless authentication and encryption methods. Available options are: **Open - No Encryption**, **Static WEP**, **802.1X**, **WPA-TKIP** and **WPA2-AES:CCMP**. Selecting Open - No Encryption disables encryption. For details on the other options, please refer to: **7.2.1.1 - Static WEP Parameters** **7.2.1.2 - 802.1x Parameters** **7.2.1.3 - WPA Parameters**

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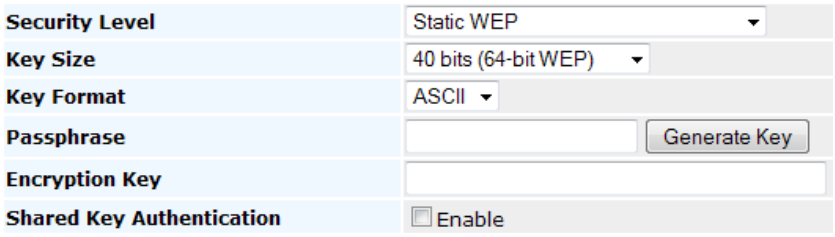
7.2.1.1 Static WEP

The configuration of Static WEP parameters enables pre-shared WEP key encryption. Authentication is not supported by this method.

The security level of this method is known to be weak.

Static WEP parameters are entered via the following screen upon selection:



Static WEP Parameters	
Key Size	The setting can be configured as either **40 bits (64-bit WEP)** or **104 bits (128-bit WEP)**. (For **WDS** setting, **128 bits** will also be available.)
Key Format	The setting can be configured as either **ASCII** or **HEX**. • ASCII will be applied to encryption keys that are manually entered only. • HEX will be applied to encryption keys that are either manually entered or automatically generated.
Passphrase	Combination of words and characters used to generate an encryption key. Click **Generate Key** to create the key.
Encryption Key	This setting specifies a user-specified encryption key value. For **ASCII** format, key length is either **5 or 13**. For **HEX** format, key length is either **10 or 26**.
Shared Key Authentication	This setting enables the use of shared key authentication. Open authentication is the default authentication.

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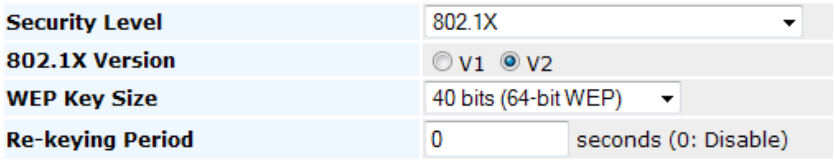
7.2.1.2 802.1X Parameters

The configuration of 802.1X parameters enables Radius-based 802.1X authentication with a dynamic WEP key. Once selected, Radius Server Setting will be available.

The configuration screen is as follows:



802.1x Parameters	
802.1X Version	This setting selects between **v1** or **v2** of the 802.1x EAPOL. When v1 is selected, both v1 and v2 clients can associate with the access point. However, when v2 is selected, only v2 clients can associate with the access point. Most modern wireless clients support v2. In the event that there are stations that do not support v2, select the option v1. By default, the value of the setting is **v2**.
WEP Key Size	The setting can be configured as either **40 bits** or **104 bits**.
Re-keying Period	This setting specifies the length of time throughout which the broadcast key remains valid. Upon expiration of Re-keying Period, the broadcast key will no longer be valid and the renewal of the broadcast key will be required. The default is 14400 seconds (i.e. 4 hours). A value of **0** disables re-keying.

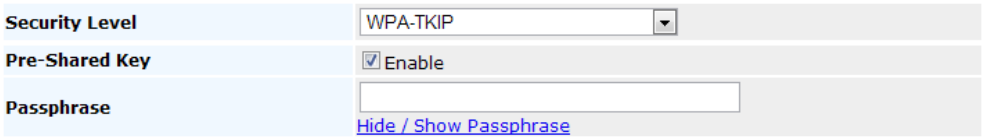
7.2.1.3 WPA parameters

The configuration of WPA parameters enables **WPA-TKIP**, **WPA2-AES:CCMP** and **WPA-TKIP and WPA2-AES:CCMP**.

To enable WPA and WPA-PSK, configure WPA-TKIP. To enable WPA2 and WPA2-PSK, configure WPA2-AES.

When WPA or WPA2 is configured, Radius-based 802.1x authentication with TKIP encryption method is enabled. Under this configuration, the **Pre-Shared Key** option should be disabled.

The security level of this method is known to be very high.



When WPA-PSK or WPA2-PSK is configured, a **Pre-Shared Key**, or **Passphrase**, is used for data encryption and authentication. Under this configuration, the Pre-Shared Key option should be enabled. Key length must be between 8 and 63 characters (inclusive).

The security level of this method is known to be high.

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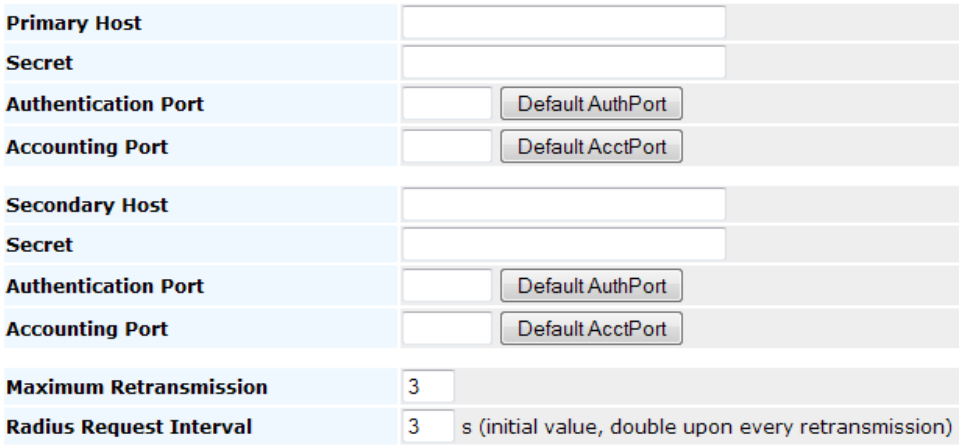
7.2.1.4 Radius Server Settings



Radius Server Settings	
Primary Host	When 802.1x authentication is configured, the Radius server specified by this setting will be used for authentication and accounting.
Secret	This is the secret for accessing the Radius server.
Authentication Port	This specifies the UDP port number for the Authentication port of the Radius server.
Accounting Port	This specifies the UDP port number for the Accounting port of the Radius server.
Secondary Host	This setting specifies the Radius server to used for authentication and accounting in the event that the host specified by Primary Host is unavailable.
Maximum Retransmission	This specifies the maximum number of retry for RADIUS authentication. By default, it is set as **3**.
Radius Request Interval	This specifies the time interval in second between each RADISU request attempt. Note that the request time interval would be doubled every retransmission. By default, it is set as **3s**.

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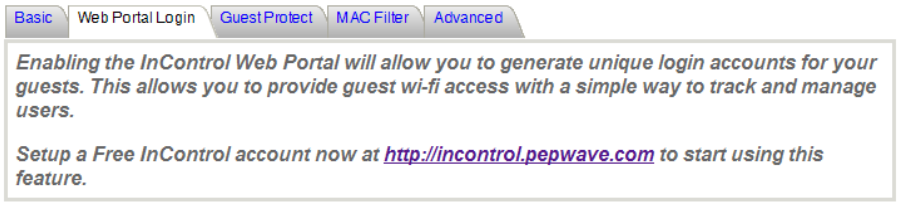
7.2.2 Web Portal Login


Basic
Web Portal Login
Guest Protect
MAC Filter
Advanced
Enabling the InControl Web Portal will allow you to generate unique login accounts for your guests. This allows you to provide guest wi-fi access with a simple way to track and manage users.
Setup a Free InControl account now at http://incontrol.pepwave.com to start using this feature.

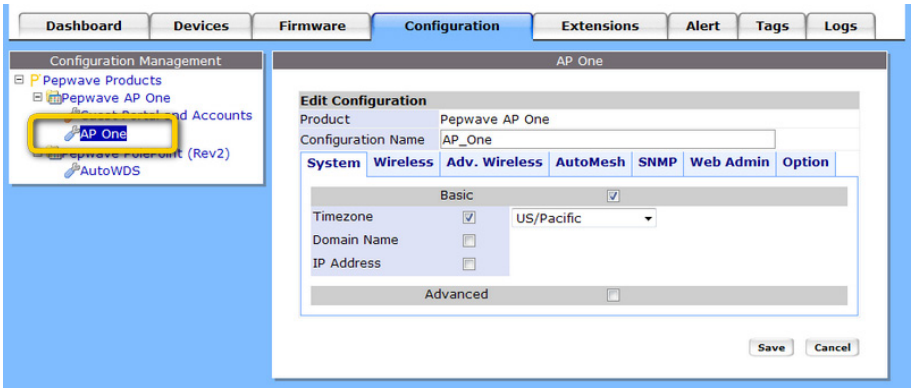
Simply registering the devices with Pepwave InControl, users can apply configurations, firmware, and monitor network activity remotely through this centralized management system. For more details, you can refer to Pepwave website at: http://www.pepwave.com/products/incontrol/.

Tip: How to Set Up AP One Guest Portal in InControl

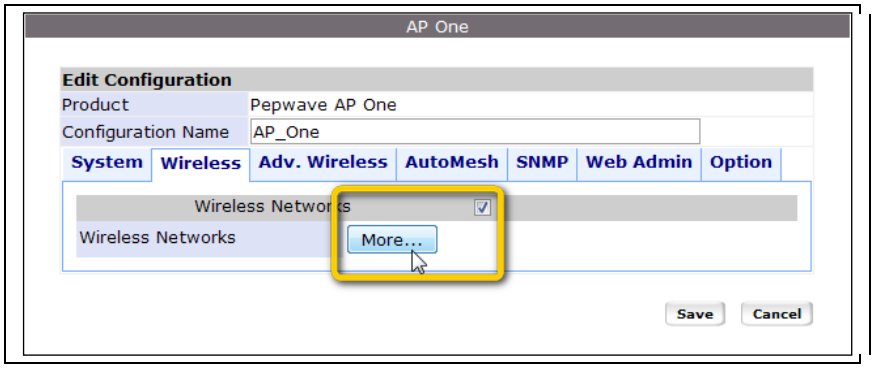
To set up Guest Portal, you need to (1) enable guest portal function and (2) create guest accounts and set up portal page.

Step One: Enable Guest Portal

1. Log in InControl using your username and password. <https://incontrol.pepwave.com/>
2. Click "Configuration" tab and find the desired configuration profile.



3. To find your wireless network, click "Wireless" tab, check the box next to "Wireless Networks" and click "More..." button.



4. Click on the name of the SSID you have set up.

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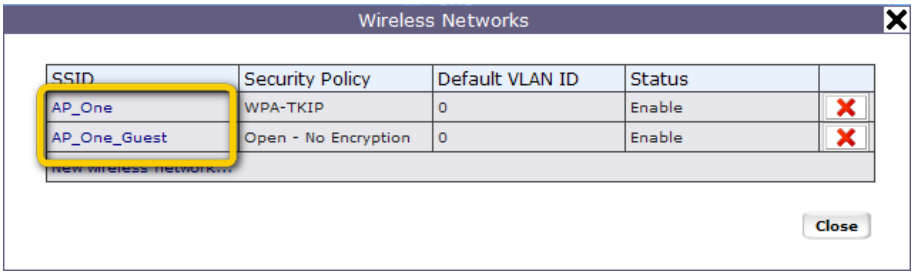
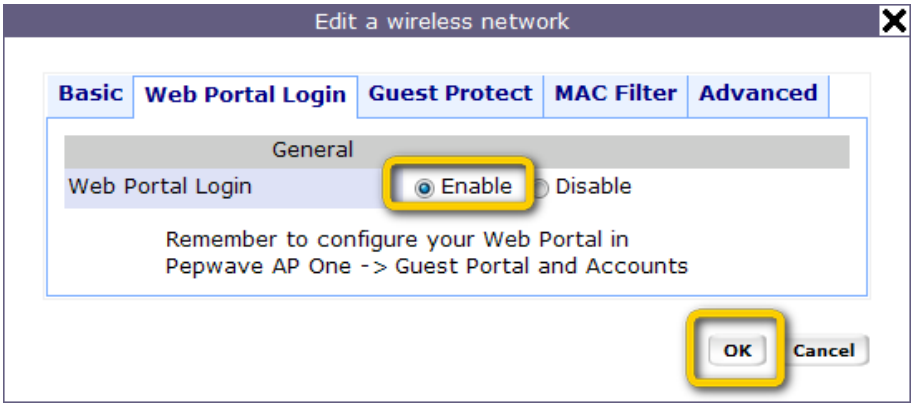
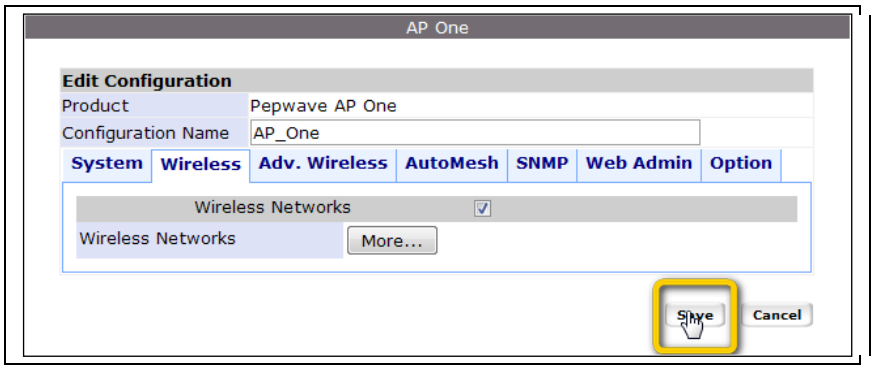
(Note: If you have not added a wireless network, you can click "New wireless network..." to set up a new one.)



5. On the "Edit a wireless network" screen, click "Web Portal Login" tab. Click "Enable" to enable the Web Portal Login function. Click "OK" to continue.



6. Click "Save" button to save the changes.



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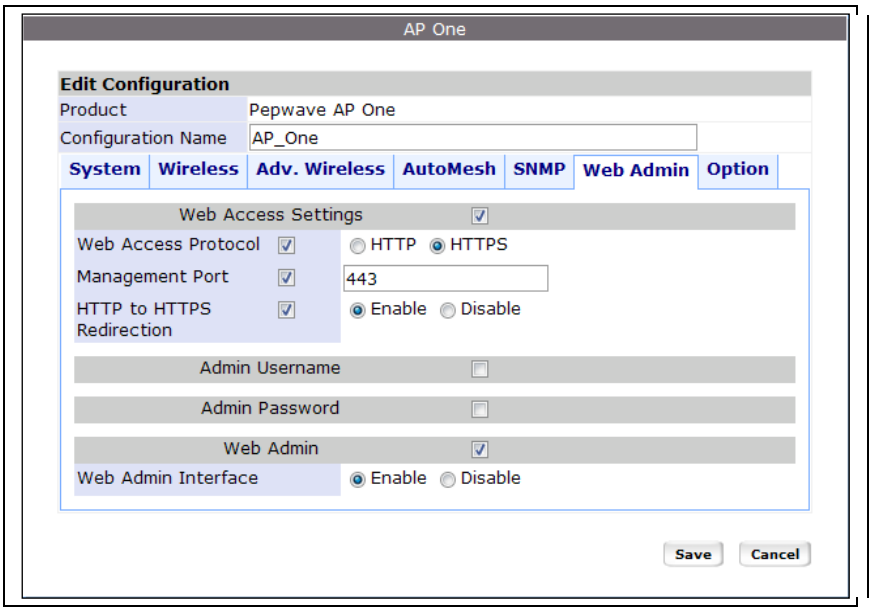
7. Click the "Web Admin" tag, and setup the web access as follows:

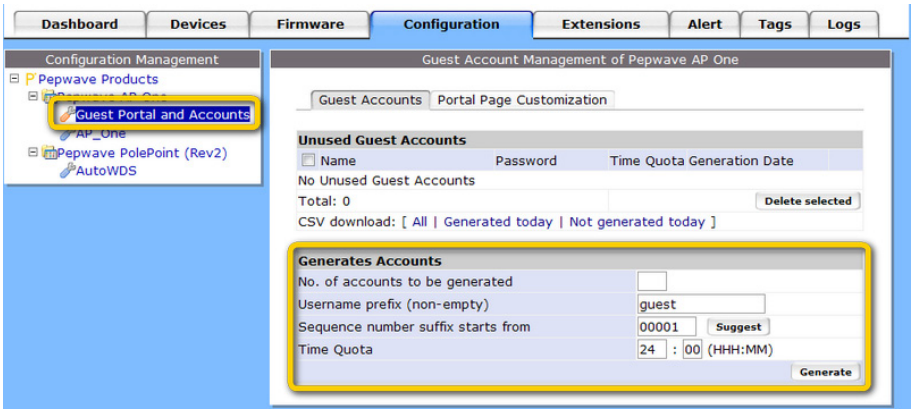
Web Access Protocol: HTTPS
Management Port: 443
HTTP to HTTPS Redirection: Enable

Click Save button to save the settings.



Step Two: Create Guest Accounts and Set Up Portal Page

8. Go to "Guest Portal and Accounts" by clicking on the link at the left panel.



9. You can generate more than one account at one time. Change the parameters in the fields No. of accounts to be generated, Username prefix, Sequence number suffix and Time Quota. Default time limit is set to 24 hours. You can change the time limit.

10. Click "Generate" button.

11. You should now have some guest accounts generated as shown in the table "Unused Guest Accounts". You can download the accounts information in CSV file by clicking the "All", "Generated

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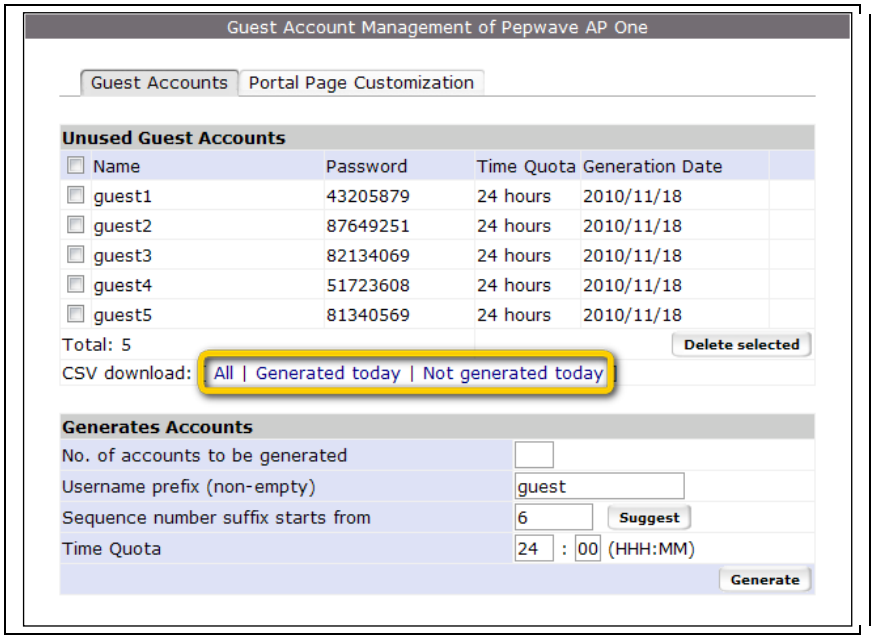
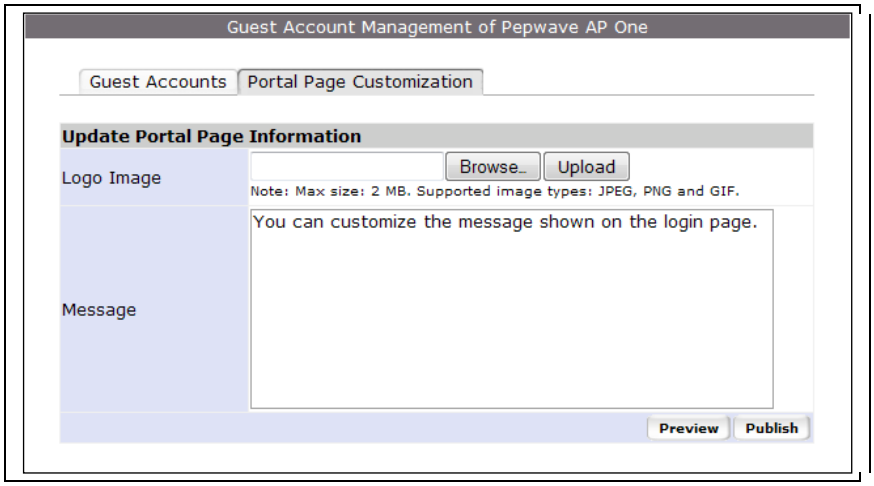
today" or "Not generated today" links.



12. A standard portal page will be generated automatically after guest accounts are generated (http://guest.pepwave.com). You can customize the portal page by clicking on the "Portal Page Customization" tab. In the screen upload your logo image and enter message for guests. You can preview your portal page and then publish the portal page.



Your guest accounts and portal page are now ready for use.

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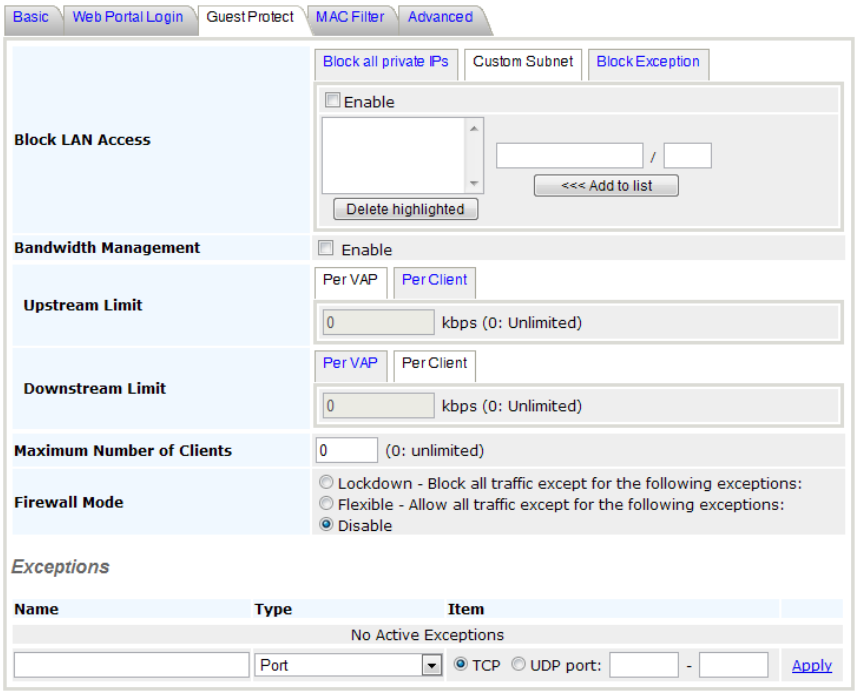
7.2.3 Guest Protect



Wireless Networks Details - Guest Protect	
Block LAN Access	This option enables the settings to **Block all private IPs** / **Custom Subnet** / **Block Exception**. If you have selected **Block all private IPs** or **Custom Subnet**, these IPs / Subnets will be blocked no matter what "Firewall Mode" selected. When Block Exception is selected, IPs entered will be excluded from the blocking list. 1. **Private IP** -- This includes the commonly known private IPs: • 192.168.0.0 - 192.168.255.255 • 172.16.0.0 - 172.31.255.255 • 10.0.0.0 - 10.255.255.255 2. **Custom Subnet** -- This includes user specified IP subnets to be blocked. 3. **Block Exception** – Only IPs specified will NOT be blocked.
Bandwidth Management	This option enables the settings to control upstream and downstream limits. You can select to either control the bandwidth usage **Per VAP** or **Per Client**.
Maximum Number of Clients	This setting specifies the maximum number of clients that can be connected to the AP One simultaneously. By default, it is set to **0: unlimited**.
Firewall Mode	This setting specifies three options: **Lockdown**, **Flexible**, and **Disable**. • **Lockdown** – Block all traffic except for the pre-defined exceptions; • **Flexible** – Allow all traffic except for the pre-defined exceptions; • **Disable** – Firewall mode is disabled. (Default option)
Exceptions	This setting specifies the exceptions when **Lockdown** or **Flexible** Firewall Mode is selected. Exceptions can be added by types, including *Port, Domain, IP Address, MAC Address, Application/Service*.

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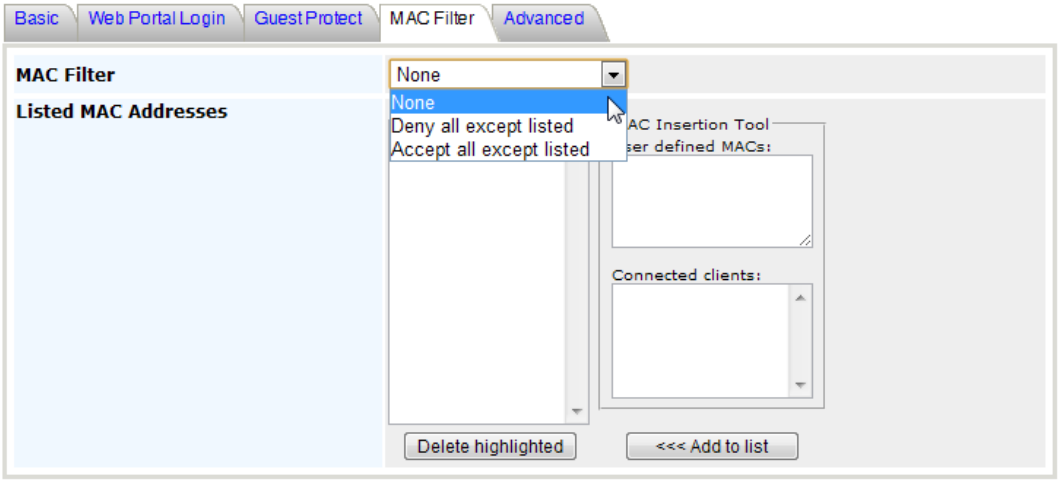
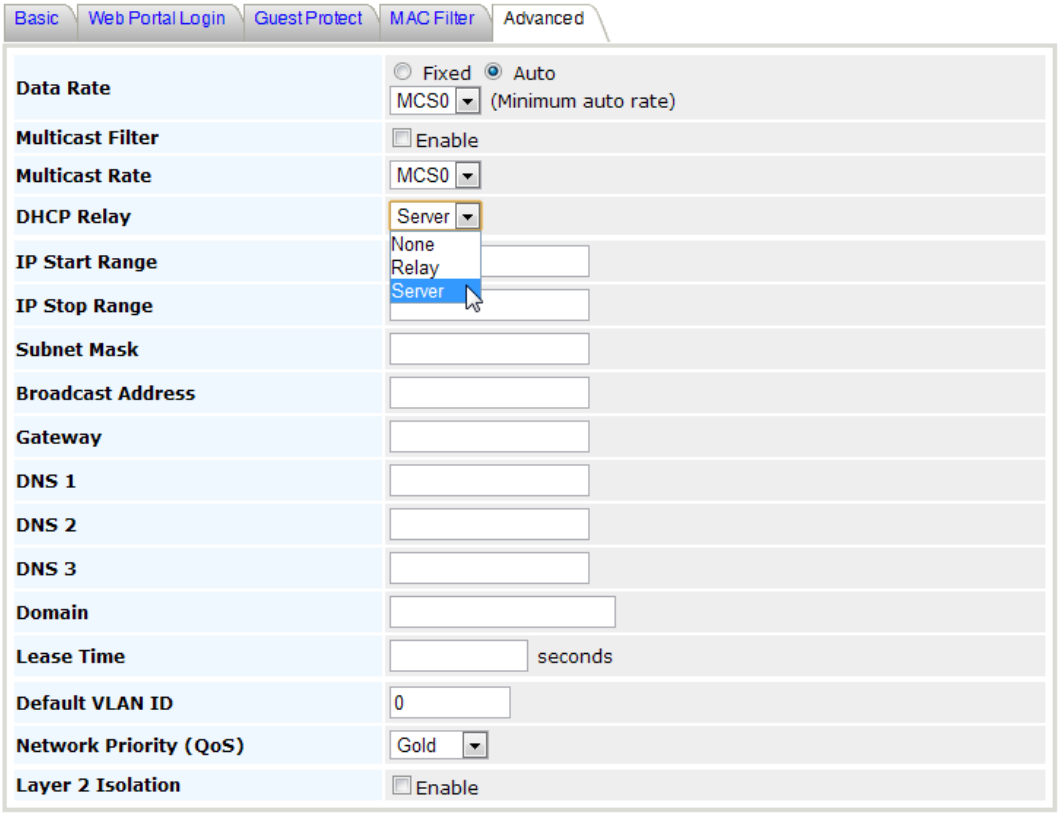
7.2.4 MAC Filter

The settings allow administrator to control the access through Mac address filtering.
Available options are: **None, Deny all except listed, Accept all except listed.**



7.2.5 Advanced



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Wireless Networks Details -Advanced	
Data Rate	There are two options on data rate: **Fixed**, **Auto** **Fixed** will forced all data packets to be transmitted into the selected transmit rate. **Auto** will automatically select the best transmit rate with a condition to use the selected transmit rate as the minimum auto transmit rate. The rate options and values will be affected by selected **Protocol** and **Channel Bonding** in section 7.3.1.
Multicast Filter	This setting enables the filtering of multicast network traffic to the wireless SSID.
Multicast Rate	This setting specifies the transmit rate to used for sending multicast network traffic. The rate options and values will be affected by selected **Protocol** and **Channel Bonding** in section 7.3.1.
DHCP Relay	The AP One will forward DHCP requests to a specified DHCP Server. This option prevents broadcast messages from being propagated on the Ethernet segment. Upon selecting this option, the DHCP Server IP address (or DHCP Server settings) will be prompted.
Default VLAN ID	This setting specifies the VLAN ID to be tagged on all outgoing packets generated from the virtual AP (i.e. packets that travel from the Wi-Fi segment, through the Pepwave AP One unit to Ethernet segment via the LAN port). If **802.1x** is enabled and a **per-user VLAN ID** is specified in the *authentication reply from the Radius server*, then the value specified via Default VLAN ID will be overridden. The default value of this setting is 0. That means VLAN tagging is disabled (instead of tagged with zero).
Network Priority (QoS)	The 802.1p QoS value to be marked on all outgoing packets generated from the virtual AP (i.e. packets that travel from the Wi-Fi segment, through the Pepwave AP One unit to Ethernet segment via the LAN port). Possible values are **Gold**, **Silver** and **Bronze**.
Layer 2 Isolation	**Layer 2** is in reference to the second layer in the ISO Open System Interconnect model. When this option is enabled, clients on the same VLAN, SSID or subnet are not allowed to communicate directly via the Layer 2 Protocol(s). Traffic is passed to upper communication layer(s). With this option disabled, clients on the same VLAN are allowed to communicate with each other directly. (Windows network resources browsing will be possible.) By default, the setting is **disabled**.

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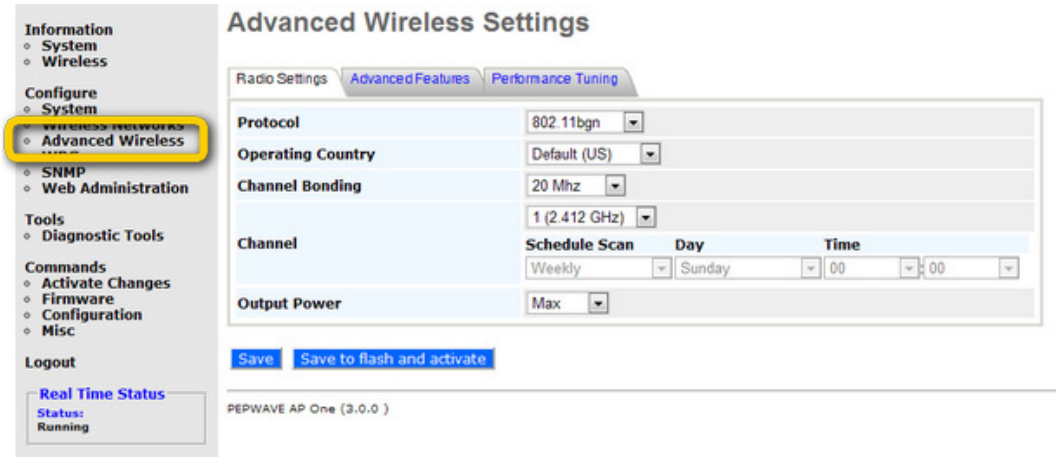
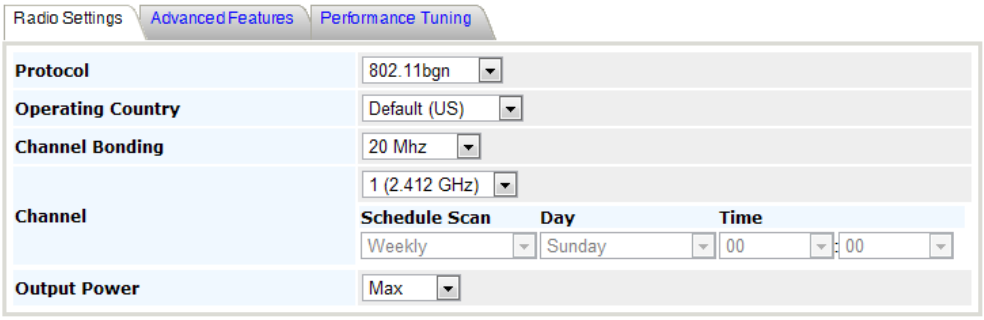
7.3 Advanced Wireless Settings

Advanced Wireless Settings provides more options to fine tune the parameters on the system to achieve the optimal performance.



7.3.1 Radio Settings



Radio Settings	
Protocol	Four options are available: **802.11bgn**: Pepwave AP One accepts 802.11b, 802.11g and 802.11n client association requests. **802.11b/g**: Pepwave AP One accepts both 802.11b and 802.11g client association requests. **802.11b Only**: Pepwave AP One accepts only 802.11b client association requests. **802.11g Only**: Pepwave AP One accepts only 802.11g client association requests.
Operating Country	This setting specifies the country / region regulations which Pepwave AP One unit should follow. If North America region is selected, RF channels 1 to 11 are available. Maximum transmission power is 26 dBm (400 mW). If Europe region is selected, RF channels 1 to 13 are available. Maximum transmission power is 20 dBm (100 mW).

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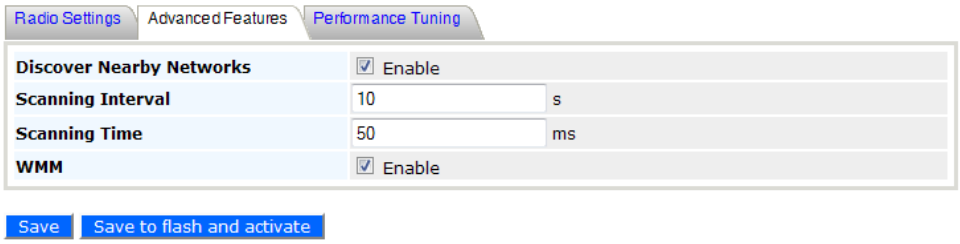
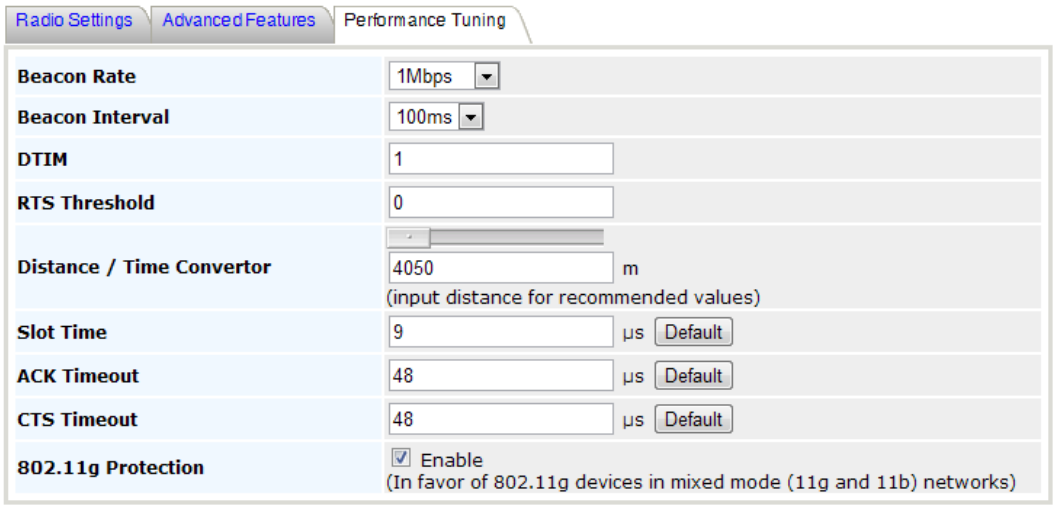
Channel	This option selects the 802.11 channel to be utilized. Available options are from **1 to 11**, and from **1 to 13** for the country setting of North America region and Europe region, respectively. (Channel 14 is only available when the country is selected as Japan with protocol 802.11b.) If **Auto** is set, the system would perform channel scanning based on the scheduled time set and choose the most suitable channel automatically.

7.3.2 Advanced Features



Advanced Wireless Settings – Advanced Features	
Discover Nearby Network	The AP would scan and discover nearby network if this option is enabled.
Scanning Interval	This setting determines how often the access point goes to other channels to discover Neighbor AP.
Scanning Time	This setting determines how long the access point stays on the other channels to discover Neighbor AP.
WMM	This option enables the Wi-Fi Multimedia (WMM), as known as Wireless Multimedia Extensions (WME) on the access point. It is always on by default.

7.3.3 Performance Tuning



Advanced Wireless Settings – Performance Tuning

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Beacon Rate	This setting provides the option to send beacon in different transmit bit rate and the bit rates are: **1Mbps**, **2Mbps**, **5.5Mbps**, **6Mbps**, **11Mbps**.
Beacon Interval	This setting provides the option to set the time between each beacon send. Available options are: **100ms**, **250ms** and **500ms**.
DTIM Period	This setting provides the option to set the frequency for beacon to include Delivery Traffic Indication Message, DTIM. The interval unit is in millisecond.
RTS Threshold	This setting provides the option to set the minimum packet size for the unit to send an RTS using the RTS/CTS handshake. Setting zero would disable this feature.
Distance / Time Convertor	This is a convertor which will automatically adjust and recommend the Slot Time, ACK Timeout and CTS Timeout based on the distance you have entered.
Slot Time	This setting provides the option to modify the unit wait time before it transmits. The default value is 9µs.
ACK Timeout	This setting provides the option to set the wait time to receive acknowledgement packet before doing retransmission. The default value is 48µs.
CTS Timeout	This setting provides the option to specify the timeout for the unit to wait for CTS response in the RTS/CTS handshake. The default value is 48µs. This option will be disabled if you have chosen to use protocol 802.11bgn.
802.11g Protection	Enable this setting to in favor of 802.11g devices in mixed mode (11g and 11b) networks. This option will be disabled if you have chosen to use protocol 802.11bgn.

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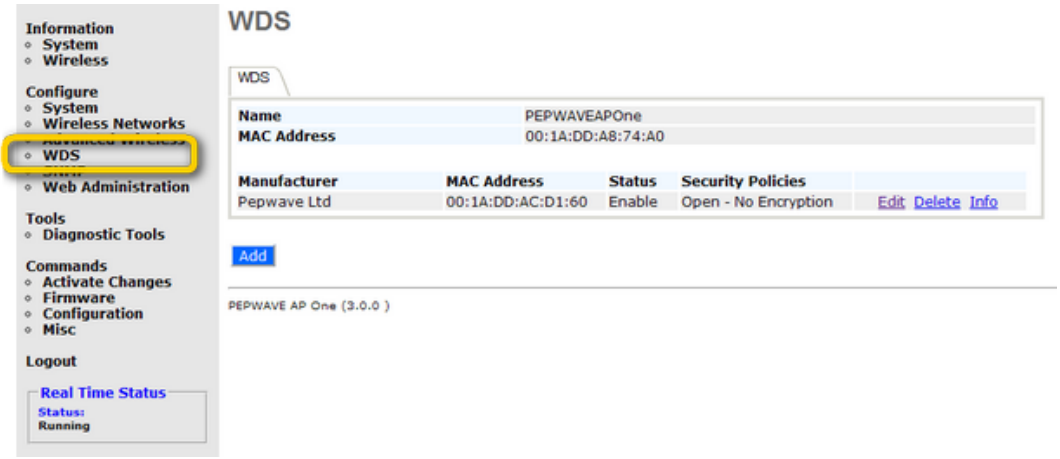
7.4 WDS

Wireless Distributed System - WDS provides a way to link APs together when wired cabling is not preferable. This also extends the wireless coverage of the wireless network for the wireless clients.



Click **Add** to add and configure a new WDS peer connection.

WDS Settings	
Enable	This option enables this entry.
MAC Address	This setting gives the MAC address of the other AP to form a WDS link.
Security Policy	For more details, please refer to section 7.2.1.1 Static WEP

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7.5 SNMP

7.5.1 SNMP Settings

Upon selecting ***SNMP*** from the navigation bar on the left-hand-side of the Main Menu, the following page is displayed to enable the configuration of SNMP server settings:

SNMP Settings	
Server Name	This setting specifies the name that identifies the SNMP server.
SNMPv1	This setting specifies whether to enable or disable the support for Version 1 of SNMP.
SNMPv2	This setting specifies whether to enable or disable the support for Version 2 of SNMP.
SNMPv3	This setting specifies whether to enable or disable the support for Version 3 of SNMP.
SNMP Trap	SNMP Trap is a message initiated from a client and sent to the AP One device. Once this option is enabled, the following two options for SNMP Trap will be available for configuration.
SNMP Trap Receiver Name	This setting specifies the name that identifies the SNMP Trap Receiver.
SNMP Trap IP Address	This setting specifies the IP address of the SNMP Trap Receiver.

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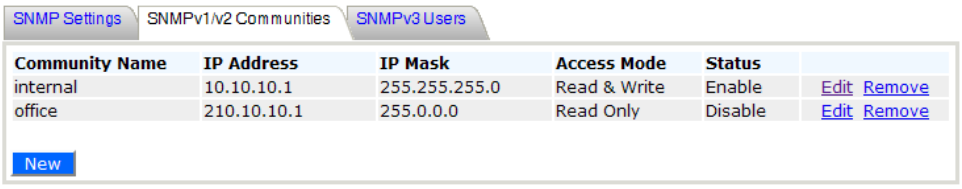
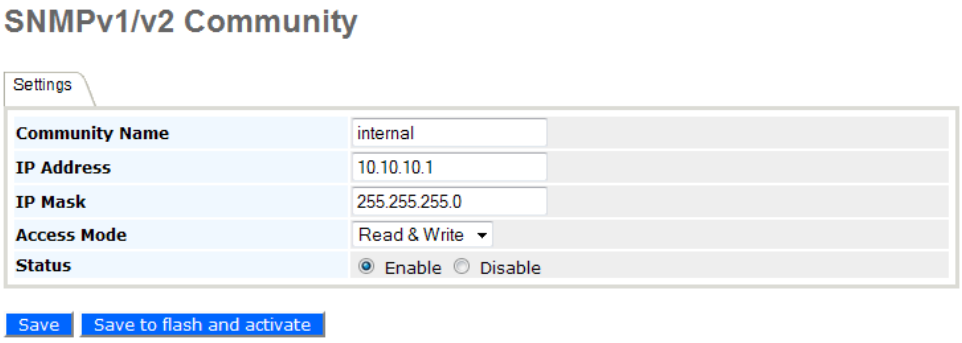
7.5.2 SNMPv1 / SNMPv2 Communities



By adding SNMPv1/v2 Communities, access rights can be controlled. Click on the **New** button to add one.



SNMPv1 / SNMPv2 Communities	
Community Name	The **password** for getting or setting SNMP values.
IP Address and IP Mask	The allowed IP and subnet address which can access the SNMP server.
Access Mode	Choose either **Read Only** or **Read & Write**.
Status	**Enable** or **Disable** this community.

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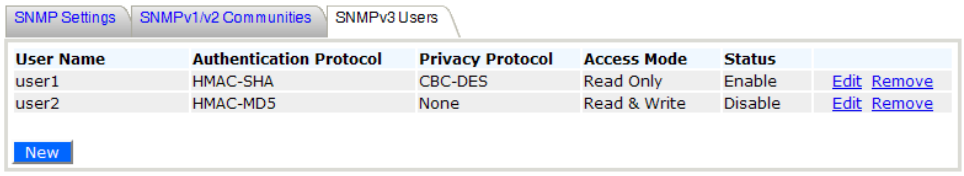
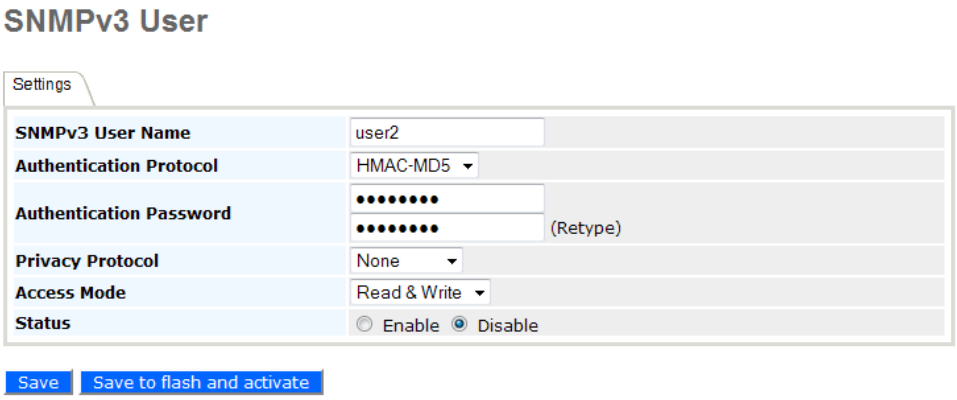
7.5.3 SNMPv3 Users



By adding SNMPv3 users, access rights can be controlled. Click on the **New** button to add one.



SNMPv3 User Setting	
SNMPv3 User Name	The user ID to be allowed to access the SNMP agent.
Authentication Protocol	The protocol for authenticating the user. Available options are: **HMAC-MD5** and **HMAC-SHA**.
Authentication Password	Users provided with a correct password will be granted the right to access the SNMP agent.
Privacy Protocol	The encryption method to be used in SNMPv3 communication. Available options are: **None** and **CBC-DES**.
Privacy Password	This option is shown only if CBC-DES is chosen as the Privacy Protocol. This is the key for decrypting the encrypted data.
Access Mode	Grant **Read** or **Read & Write** access to this user.
Status	**Enable** or **Disable** this user.

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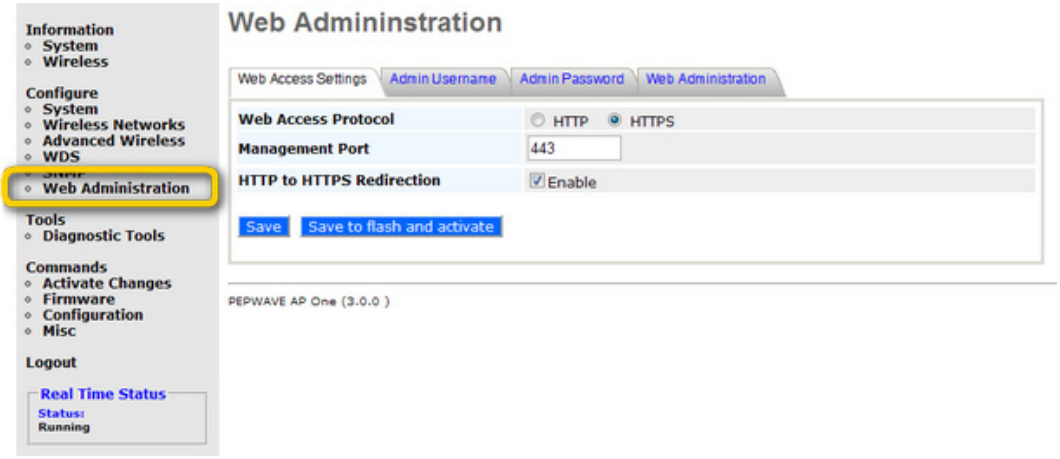
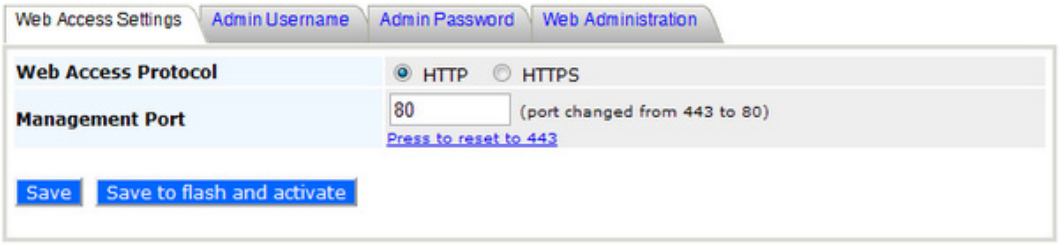
7.6 Web Administration

Upon selecting ***Web Administration*** from the navigation bar on the left-hand-side of the Main Menu, the tabs of configuring the management interface are displayed.

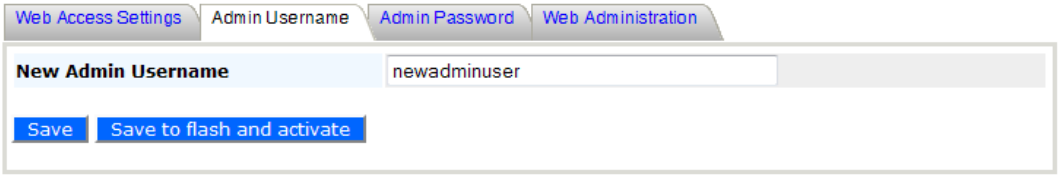


7.6.1 Web Access Settings



The selection ***Web Access Settings*** configures the protocol and TCP port number of the web server. If **HTTPS** is enabled, **HTTP to HTTPS Redirection** option will be provided.

7.6.2 Admin Username



The selection ***Admin Username*** configures the administrator username for entering Web Admin Interface. To change to the Username, enter the new username into the **Username** input fields.

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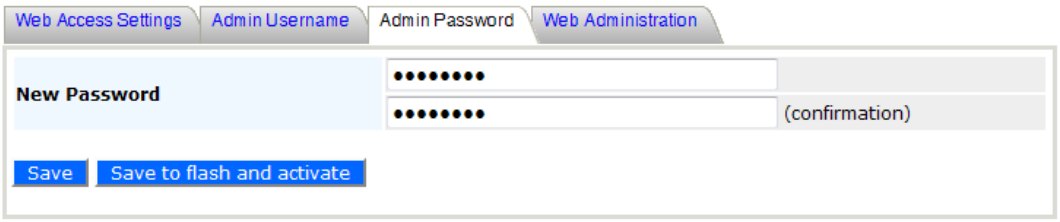
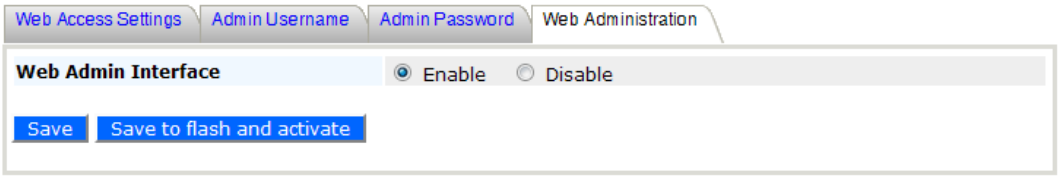
7.6.3 Admin Password



The selection ***Admin Password*** configures the administrator password for entering Web Admin Interface. To change to the password, enter the same new password into the **New Password** and **New Password (Retype)** input fields.

7.6.4 Web Administration



The selection ***Disable Web Administration*** turns off the access to Web Administration Interface. After being turned off, Web Administration Interface can be re-enabled using SNMP.

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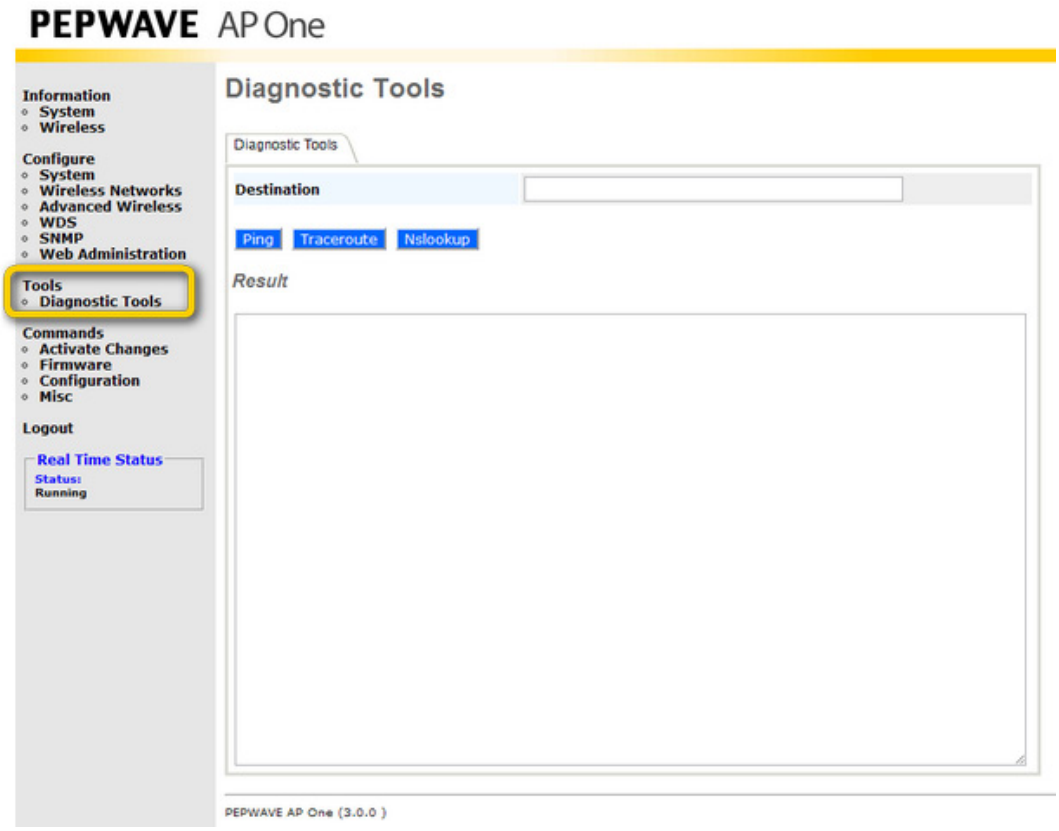
8 Tools - Diagnostic Tools

This provides three useful tools for diagnosing the network. The three available options are: **Ping**, **Traceroute** and **Nslookup**.



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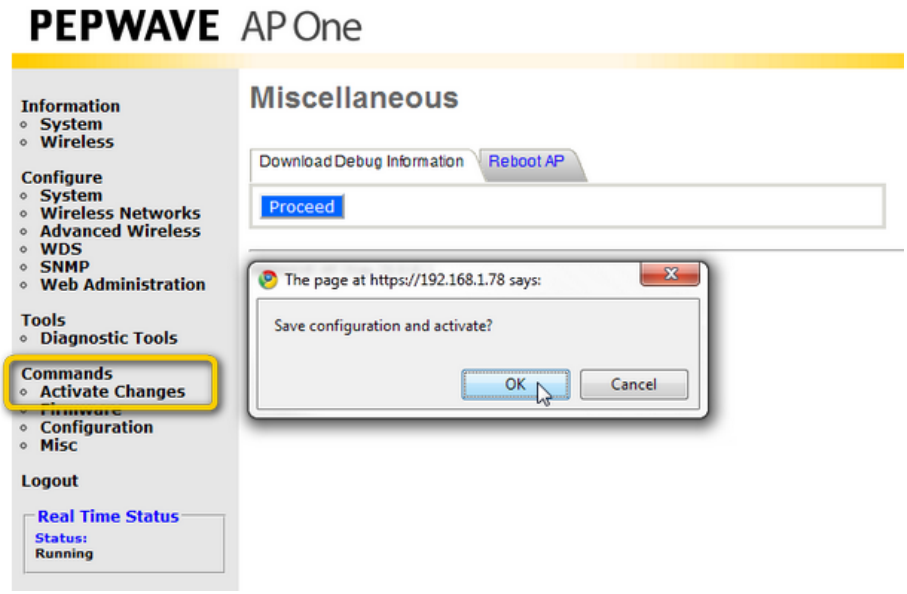
9 Commands

Upon selecting ***Commands*** from the navigation bar on the left-hand-side of the Main Menu, a list of commands is displayed, as follows:

9.1 Activate Changes

Click on ***Activate Changes*** and a prompt will ask and confirm to save configuration and activate the AP One unit.



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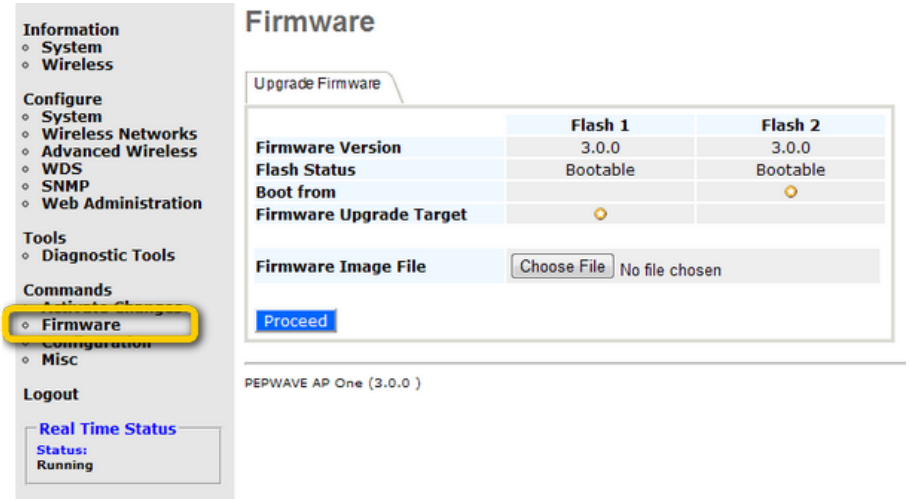
9.2 Firmware



Commands - Firmware	
Firmware Version	This shows the firmware version loaded into the flash partitions.
Flash Status	This shows the firmware status on the flash partitions.
Boot from	This indicates which flash partition boots up the system.
Firmware Upgrade Target	This shows which flash partition is used for firmware upgrade.
Firmware Image File	Upload a firmware file for upgrading the unit's software. A reboot is required after upgrading the firmware.

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9.3 Configuration

Commands - Configuration	
Restore Factory Default	This command is for restoring factory default settings of the AP One. Preserve the network settings by checking the box next to **Preserve Settings** and select Proceed. Settings including Server IP, Subnet Mask, Default Gateway, DNS Server and Management VLAN ID will be preserved.
Download Active Configuration To File	Select this command to download the active configuration for backup purposes.
Upload Configuration File	Select this command to upload the configuration from a backed up configuration file.

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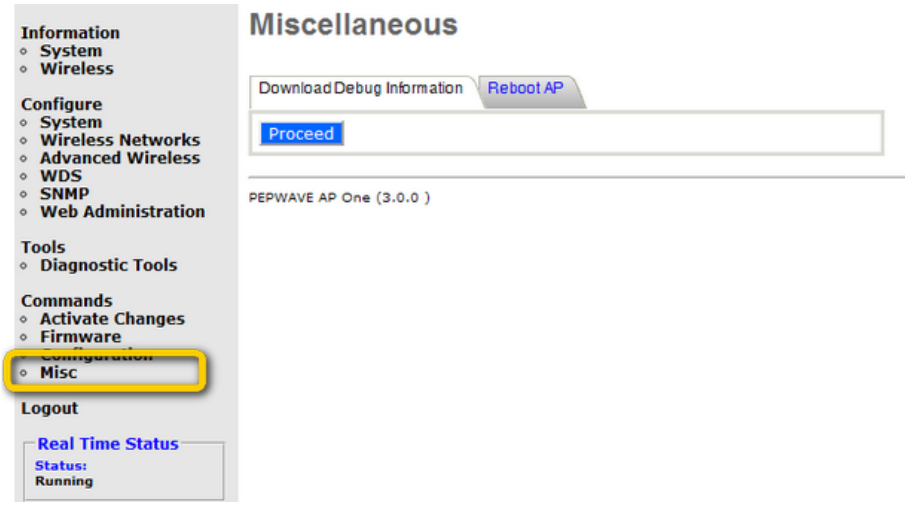
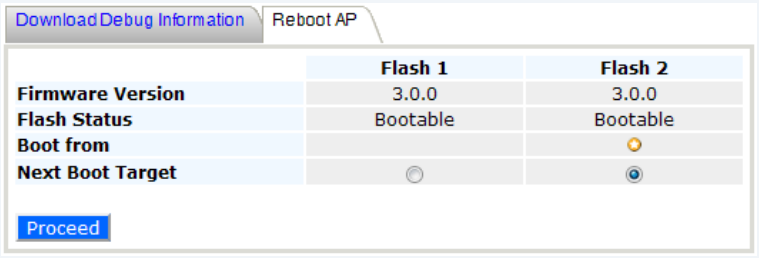
9.4 Misc



Commands - Misc	
Download Debug Information	Select this comment to download debugging information from the Pepwave AP One unit. In the event of technical issues, to facilitate prompt resolution by technical support from Pepwave, please send along with a debug file with the support request.
Reboot AP	This option is for rebooting the Pepwave AP One unit. The Boot up firmware from Flash 1 or 2 can be selected and changed in here. 

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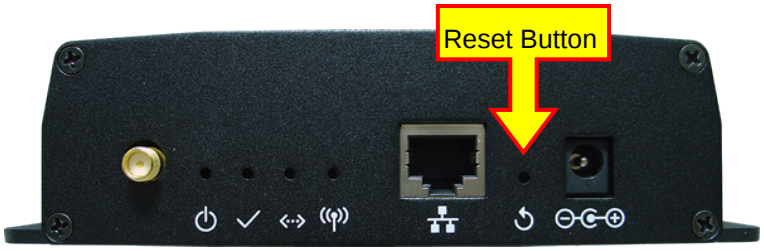
10 Restoration of Factory Defaults

10.1 AP One

The following procedure restores the settings of Pepwave AP One device to factory defaults:

1. Power on the unit, wait for 1 minute until the Status LED turns green.
2. Press and hold the reset button on the rear panel for at least 5 seconds, then release.
3. The Status LED will blink, and then the unit will automatically reboot.
4. Wait for 1 minute or until the Status LED turns green, upon which the settings of Pepwave AP One will have been restored to the factory defaults.

By default, the unit will acquire an IP address from a DHCP server.



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Appendix A.

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

1) Reorient or relocate the receiving antenna.
2) Increase the separation between the equipment and receiver.
3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4) Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

IMPORTANT NOTE

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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Broadband Possibilities

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